5.5 INDICATOR CONTAMINANTS IN TRANSITION ZONE WATER AND GROUNDWATER SEEPS

This section summarizes the Study Area data for TZW and groundwater seeps. As described in Section 3, the transition zone is defined as the interval where both groundwater and surface water comprise some percentage of the water occupying pore space in the sediments. The primary focus of the transition zone for this investigation is within the shallow sediment (0 to 38 cm bml), which includes the biologically active zone.[1] Deeper (>90 cm bml) TZW samples are also discussed here to lend insight into observed chemical distribution patterns.

The following subsections present tables, plan view maps with histograms, and scatter plots to support brief discussions of nature and extent for the select ~~IC~~ indicator contaminant list (Table 5.1-2). The full RI data sets for TZW and groundwater seeps for all sampled chemicals (those data of adequate quality) are presented in the RI SCRA database and summarized in Appendix D4, Tables D4-1 and D4-2. ~~In addition, TZW sampling results are compared to various water screening values in Appendix D3.3.~~

5.5.1 Transition Zone Water

The TZW sampling effort was not a harbor-wide study of TZW, but instead was a focused investigation offshore of nine study sites. Other areas of groundwater discharge to the river are not captured in this data set. Further, the sampling investigation of TZW did not seek to ~~delineate~~ distinguish between areas impacted by upland sourced groundwater plumes or impacted by river sediments.[2] The approach to site selection is discussed in greater detail in Appendix C2.

The TZW investigations performed for the RI focused solely on areas of confirmed or likely groundwater plume discharge to the river and did not seek to characterize TZW pore water chemistry elsewhere in the Study Area. Accordingly, this discussion does not address TZW ~~pore water~~ chemistry in areas with no upland groundwater discharge, or areas of clean groundwater flowing through contaminated sediments. Additionally, this study does not distinguish the relative contribution of upland groundwater plume discharges and contaminants in sediment to the concentrations measured in TZW. Consideration of pore water chemistry affected by in-river sediment contamination is evaluated in Section 6 loading calculations through equilibrium partitioning calculations based on the large data set of sediment concentrations. These calculated estimates of pore water concentrations are not presented here as part of the TZW nature and extent presentation because they are not actual field measurements.

[1] The biologically active zone is defined by the depth of biological processes. The depth of the true biologically active zone varies widely throughout the Study Area, based on factors that control benthic community structure, such as sediment texture, sediment-water interface dynamics, and organic loading.

[2] In areas not directly affected by transport of contaminants originating in upland groundwater, contaminants may be present in TZW as a result of desorption from contaminated sediments and/or geochemical processes within the sediments and associated TZW.

Commented [JMK1]: All items highlighted in yellow are references to items in other sections that will need to be reviewed and revised based on revisions to other sections of the RI.

Commented [Integral2]: Changed "IC" to "indicator contaminant" throughout for consistency with other sections of the RI.

Commented [A3]: Check and make sure that these are presented OK.

Commented [JMK4]: Since these are the base for Tables 5.5.1 and 5.5.2, the new text tables should only include the ICs while the appendix tables should include the remaining chemicals.

Commented [Integral5]: We porposet removal of Appendix D3.3 from the RI. Appendix D3.3 is not referenced in any other part of the RI. The surface water screening to WQC has been haded to section 5.4. In addition, Appendix D3.3 is not discussed further in Section 5.5 or the DF Section 10.

Commented [Integral6]: Sentence appeared to be missing a word.

Commented [Integral7]: Propose changing the word "delineate" to "distinguish between" to retain the original meaning of this sentence, which was slightly modified by the wording change from "unimpacted" to "impacted" (original sentence from Draft Final RI: "the sampling investigation of TZW did not seek to delineate TZW chemistry in areas unimpacted by upland plumes but possibly impacted by river sediment").

Commented [Integral8]: Propose that the text referring to Appendix C2 for additional information regarding TZW site selection be retained early in this section to provide background information to the reader.

Commented [Integral9]: Propose that the word "plume" be retained. As described in Appendix C2, the TZW samples were collected offshore of 9 sites with evidence of a complete pathway for an upland plume to connect to TZW in the river. Therefore, it is descriptive to refer to these as areas of likely groundwater plume discharge and distinguish them from areas of groundwater discharge that is not associated with likely complete plume pathways. Per meeting with EPA on 7/8/14, agreed that Integral would note areas to insert the word "plume".

Commented [Integral10]: Propse deleting "discharges" because this suggests discharge to surface water rather than discharge to TZW.

Commented [Integral11]: The following text reference to Section 6 was deleted, we propose retaining it to point the reader to analysis of sediment contribution to pore water: "Consideration of pore water chemistry affected by in-river sediment contamination is evaluated in Section 6 loading calculations through equilibrium partitioning calculations based on the large data set of sediment concentrations. These calculated estimates of pore water concentrations are not presented here as part of the TZW nature and extent presentation because they are not actual field measurements."

TZW data are presented on plan-view maps and/or scatter plots for select contaminants to support evaluation of sample composition. These presentations vary by analyte and the data are summarized in Table 5.5-1. As reflected in Table 5.5-1, the TZW analyte lists varied by study site; therefore, it was often unnecessary to produce maps for each river mile for a given analyte.

Maps: Map presentations of TZW data use color-coded symbols and fly out labels to provide the individual concentration values. This presentation includes distinction of Peeper samples (0 to 38 cm bml), shallow TZW Trident samples (0 to 30 cm bml) and deeper Trident samples (90 to 150 cm bml), as well as non-LWG ~~shallow~~ (0 to 90 cm bml)[3] ~~and deeper (91 cm bml)~~ Geoprobe samples. Paired map sets are presented for each river mile to show filtered and unfiltered results, where available. Diffusion-based ~~Semi-permeable membrane devices~~ (peeper) samples are presented with a unique symbol on both filtered *and* unfiltered images to allow for a detailed evaluation of results. A histogram of detected contaminant concentrations is inset on each map to provide context for the results presented on the given river mile relative to the results from the entire Study Area. Histogram bins and concentration color ranges were selected based on professional judgment to best present the complete range of filtered and unfiltered concentration values observed across the Study Area. Maps 5.5-1 through 5.5-6 are provided for Total DDx, Total PAHs, arsenic, chromium, copper and zinc.

Scatter Plots: Scatter-plot presentations of TZW data show sample concentrations plotted according to the river mile of the sample location. Color-coded symbols distinguish sample type and depth. Paired plot sets are presented for each contaminant to show filtered and unfiltered results, where available. Peeper samples are presented with a unique symbol on both filtered *and* unfiltered images to allow for a detailed evaluation of results. Scatter plots are provided for Total DDx, Total PAHs, arsenic, chromium, copper and zinc as Figures 5.5-1a-f.

~~The TZW presentation provided in this section supports the detailed site-by-site presentation and analysis of groundwater pathways presented in Appendix C2. The Appendix C2 presentation of TZW provides data analysis focused on identification of complete groundwater pathways from upland plumes to the transition zone, including some cross-media analysis. This section focuses on presentation of the distribution of ICs observed in the transition zone. As such, this section does not discuss all contaminants from groundwater sources within the Study Area or relate observations to sources.~~

Commented [Integral12]: Moved footnote to next section (TZW Data Set) to be included with overall description of sample types and depths included in this section.

Commented [Integral13]: For the select indicator chemicals now presented in this section (total DDx, total PAHs, arsenic, chromium, copper, zinc), no 91 cm bml Geoprobe data is available. All Geoprobe samples presented for these 6 chemicals in the main text is from 0 – 90 cm bml.

Geoprobe data collected at 91 cm bml is available for naphthalene, which will be presented in the appendix.

Commented [Integral14]: Propose change from "semi-permeable membrane device" to "diffusion-based samplers". The peepers are not a "semi-permeable membrane device", but instead they are a "diffusion-based sampler". SPMDs require sorption onto the membrane material, while peepers require equilibrium between the porewater and the DI water in the peeper chambers.

Commented [Integral15]: Per meeting with EPA on 7/8/14, paragraph deleted here and moved to the first paragraph in the next section (TZW Data Set).

[3] ~~For the Gasco study (sample IDs that begin with "GS-"), the sample collected at the uppermost depth in the 0 to 90 cm bml interval at each location is presented on maps to representation of the TZW concentrations in the shallow layer. No deeper data collected as part of the Gasco study is presented. For the Siltronic study (sample IDs that begin with "GP-"), samples collected at 31 cm bml are presented as shallow TZW, and samples collected at 91 cm bml are presented as deeper TZW.~~

~~5.5.2~~5.5.1.1 TZW Data Set

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The TZW presentation provided in this section supports the detailed site-by-site presentation and analysis of groundwater pathways presented in Appendix C2. The Appendix C2 presentation of TZW provides data analysis focused on identification of complete groundwater pathways from upland plumes to the transition zone, including some cross-media analysis. This section focuses on presentation of the distribution of ICs observed in the transition zone. As such, this section does not discuss all contaminants from groundwater sources within the Study Area or relate observations to sources. The TZW chemistry data used in this investigation were generated during the following field events:

2004 Pilot Study – Integral 2006a

2005 Round 2 GWPA – Integral 2006d

2005 Siltronic Investigation – HAI 2005b; MFA 2005b

2007 Gasco Investigation – Anchor 2008b[4]

Commented [Integral16]: Moved footnote to next section (TZW Data Set) to be included with overall description of sample types and depths included in this section.

These sampling activities focused on the offshore area of nine sites along the west bank of the river (see Map 2.1-20):

- Kinder Morgan Linnton Terminal (RM 4.1 to RM 4.2)
- ARCO Terminal 22T (RM 4.7 to RM 4.9)
- ExxonMobil Oil Terminal (RM 4.8 to RM 5.1)
- Gasco (RM 6.1 to RM 6.5)
- Siltronic (RM 6.3 to RM 6.5)
- Rhone Poulenc (RM 6.7 to RM 6.9)
- Arkema (Acid Plant and Chlorate Plant areas; RM 7.2 to RM 7.5)
- Willbridge Terminal (RM 7.6 to RM 7.8)
- Gunderson (RM 8.3 to RM 8.5)

Two general types of sampling techniques were used to collect the TZW samples: diffusion samplers (small-volume peepers) and push probe samplers (Trident and Geoprobe tools were used as push probe samplers). These are described in detail in the Pilot Study FSP (Integral 2004a). All peeper samples were collected over the depth interval of 0 to 38 cm bml. Trident samples were collected at 30 cm bml, with a few

[4] ~~Only one sample (GS-C2, 73 to 103 cm bml) in the 2007 Gasco Investigation was collected in the deeper (90 to 150 cm bml) sample interval; this sample is not included in this nature and extent discussion.~~

deeper samples collected between 90 and 150 cm bml.[5] Geoprobe samples were collected at depths ranging from 30 to 6,300 cm bml, though only Geoprobe samples from 0 to 90 cm bml are presented in this discussion of TZW nature and extent.[6,7]

Because TZW samples were collected at a single point in time (for Trident and Geoprobe sampling) or over a 3-week equilibration period (for peeper sampling), LWG field sampling events were carefully timed to maximize the expected upland groundwater signal (i.e., the time of greatest groundwater discharge rate). For the Pilot Study and Round 2 TZW investigations, TZW analytical samples were collected from November 2004 to January 2005 and October to December 2005, respectively, before river water levels increased to the higher levels that typically occur from mid-winter through spring. The non-LWG TZW samples collected at Gasco that are included in this nature and extent discussion were collected between July and September 2007. The non-LWG TZW samples collected at Siltronic that are discussed here were collected in May and June of 2005.

~~5.5.2.1~~5.5.1.2 Total PCBs

TZW samples collected from the offshore areas of the nine sites ~~along the west bank of the river~~ were not analyzed for PCBs.

~~5.5.2.2~~5.5.1.3 Total PCDD/Fs

Samples were collected using Trident sampling methodology from two locations adjacent to Rhone Poulenc for PCDD/Fs analyses, RP-03-C and RP-07-B. Sample RP-03-C was collected from a depth of ~~0 to~~ 30 cm bml and analyzed for filtered and unfiltered PCDD/Fs, which were not detected above laboratory reporting limits. A parent and duplicate sample were collected from RP-07-B from a depth of ~~0 to~~ 30 cm bml for filtered and unfiltered PCDD/F analyses. Total PCDD/Fs were detected in the parent and duplicate unfiltered samples, with concentrations of 29 pg/L ~~to~~ and 51.3 pg/L, respectively. Total PCDD/Fs were ~~only~~ detected in the parent filtered sample, with a concentration of 0.865 pg/L. Due to the limited set of data, the observed distribution of total PCDD/Fs inTZW could not be adequately described; scatter plots and distribution maps are not presented.

Commented [Integral17]: Per meeting with EPA on 7/8/14, moved text from deleted "Sample Techniques" section to "TZW Data Set". Retained only text that is directly descriptive of the data used in Section 5.5. In particular, retained description of depths used.

Commented [Integral18]: Select indicator contaminants analyzed in TZW are presented in the main text: PCDD/Fs, DDx, PAHs, arsenic, chromium, copper, and zinc. Other indicator contaminants will be presented in an appendix (text, maps, and figures parallel to those presented in the main text): HPAHs, LPAHs, cPAHs, BaPEq, benzo(a)pyrene, and naphthalene, TPH, diesel range hydrocarbons, and residual range hydrocarbons, cadmium, lead, nickel, and mercury. Other indicator contaminants (PCBs, BEHP, chlordanes, aldrin, dieldrin, TBT) were not analyzed in TZW samples.

Commented [Integral19]: Modified text for consistency with similar subsections below (e.g., BEPH, chlordanes, etc.)

Commented [Integral20]: Removed hyphens from sample IDs throughout for consistency with maps.

Commented [Integral21]: Trident samples were collected at a single point depth, not over a range. Therefore, the text "0 to 30 cm bml" was changed to "30 cm bml" when describing an individual shallow Trident sample.

Commented [Integral22]: We feel that the limited data set (two stations) for Total PCDD/Fs and TCDD TEQ precludes analysis/presentation of chemical distribution. We propose adding this sentence to emphasize the small data set for TCDD/F and TCDD TEQ and to explain why maps and figures are not presented for these parameters.

[5] One Trident sample was collected at 60 cm bml at location CP-07-B. This sample is included with the 90 to 150 cm bml data set.
[6] Geoprobe data collected at 91 cm bml was collected for naphthalene and is included in Appendix D.
[7] For the Gasco study (sample IDs that begin with "GS-"), the sample collected at the uppermost depth in the 0 to 90 cm bml interval at each location is presented on maps to represent the TZW concentrations in the shallow layer. No deeper data collected as part of the Gasco study is presented. Only one sample (GS-C2, 73 to 103 cm bml) in the 2007 Gasco Investigation was collected in the deeper (90 to 150 cm bml) sample interval; this sample is not included in this nature and extent discussion. For the Siltronic study (sample IDs that begin with "GP-"), samples collected at 31 cm bml are presented as shallow TZW.

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~~5.5.2.3~~5.5.1.4 TCDD TEQ

As described above, samples were collected using Trident sampling methodology from two locations adjacent to Rhone Poulenc for PCDD/Fs analysis, RP-03-C and RP-07-B-~~TR~~. Total TEQs were calculated for the detected results in the parent and duplicate unfiltered samples collected from RP-07-B. The calculated concentrations were 1.72 J pg/L and 1.32 J pg/L, respectively. Due to the limited set of data, the observed distribution of TCDD TEQ inTZW could not be adequately described; scatter plots and distribution maps are not presented.

~~5.5.2.4~~5.5.1.5 Total DDx

DDx was sampled offshore of the former Arkema Acid Plant and Rhone Poulenc sites. All but two of the sample locations were ~~collected from locations~~ offshore of the Arkema Acid Plant site. As shown in Table 5.5-1, there are:

Commented [Integral23]: Made text edits here and in subsequent sections to try to clarify between the number of samples and the number of sample locations.

- 8 Peeper samples (0 to 38 cm bml), including two duplicates, collected offshore of the Arkema site;
- 18 shallow (0 to 30 cm bml) Trident samples, including four duplicates, collected offshore of the Arkema site and Rhone Poulenc ~~(RP-03-C)~~ (with eight collocated filtered and unfiltered samples ~~collected at six locations~~); and
- ~~4~~ 5 deep (90 to 150 cm bml) Trident samples ~~in this data set~~ (with collocated filtered and unfiltered samples collected at one location), including one ~~sample collected from~~location offshore of the Rhone Poulenc site ~~(RP-03-C)~~.

DDx compounds were detected in two of the Peeper samples, with concentrations of 0.032 J ug/L at AP03B-1 and 0.0135 J ug/L at AP04D. DDx compounds were detected in each of the shallow Trident unfiltered samples with concentrations ranging from 0.0075 J ug/L at AP04D to 3.05 J ug/L at AP-03-A. DDx compounds were detected in all but three of the shallow Trident filtered samples with detected concentrations ranging from 0.0084 NJA ug/L at AP03B-1 to 0.158 NJ ug/L at RP-03-C. DDx compounds were detected in all three of the deep Trident unfiltered samples collected offshore of the Arkema site (0.169 J ug/L to 5.73 J ug/L) and the one offshore of Rhone Poulenc (0.17 J ug/L). DDx compounds were also detected in the unfiltered sample collected offshore of Rhone Poulenc (0.179 J ug/L).

Map 5.5-1 presents filtered (top panel) and unfiltered (bottom panel) total DDx (and constituent sums 2,4'- and 4,4'-DDD, 2,4'- and 4,4'-DDE, 2,4'- and 4,4'-DDT)[8] concentrations measured in shallow (0 to 30 cm bml) Trident and deep (90 to 150 cm bml) Trident samples. Peeper samples (0 to 38 cm bml) are presented with a unique symbol on both filtered *and* unfiltered images to allow for a detailed evaluation of

Commented [Integral24]: Footnote references "A" qualifier. Per agreement with EPA, changed text from "qualifier" to "descriptor".

[8] Note that 2,4'-DDD, 2,4'-DDE, and 2,4'-DDT were not sampled during the 2004 Pilot Study; therefore, the total DDx sum for these samples consists of only the 4,4'-DDx isomers. These results are distinguished with an "A" ~~qualifier~~ descriptor on Map 5.4-1.

results. Inset histograms on Map 5.5-1 show the distribution of total DDx sample concentrations for detected filtered, unfiltered, and Peeper results. Scatter plots of filtered and unfiltered total DDx TZW concentrations from Trident and Peeper samples are provided on Figure 5.5-1a. All sample results for summed and individual DDx isomers in TZW are presented in the SCRA database and are summarized in Appendix D4, Table D4-1.

Commented [Integral25]: For consistency with the scatter plots, this sentence and the plot should include both Trident and Peeper samples.

Commented [Integral26]: A scatterplot for total DDx was not included in the Draft Final RI. A draft figure was provided to EPA on 7/18/2013.

5.5.1.6 Total PAHs ~~in TZW~~

PAHs were sampled at six of the nine TZW study sites: Kinder Morgan, ARCO, ExxonMobil, Gasco, Siltronic, and Willbridge Terminal. The discussion below focuses on Total PAH results, which are summarized in Table 5.5-1. HPAHs, LPAHs, cPAHs, BaPEq, as well as individual PAH results, are presented in Appendix D4, Table D4-1.

Total PAH data include the following samples:

- 24 Peeper samples (0 to 38 cm bml), including 6 duplicates;
- 81 shallow (0 to 30 cm bml) Trident samples, including 15 duplicates, collected from 35 locations (with collocated filtered and unfiltered samples collected at 31 locations);
- ~~X~~ 14 deep (~~60~~ 90 to 150 cm bml) Trident samples in this data set (with collocated filtered and unfiltered samples collected at 4 locations); and duplicate samples collected at 2 locations.
- 35~~X~~ unfiltered samples collected with a Geoprobe from depths of 0 to 90 cm bml.

Commented [Integral27]: All but one deep Trident samples were collected at 90, 120, or 150 cm bml. One Trident sample was collected at 60 cm bml at location CP07B. This sample was analyzed for conventionals and metals only. This sample is included with the 90 to 150 cm bml data set for those parameters.

Commented [JMK28]: We could not confirm the number of samples collected from 0-90 cm (Geoprobe) or from 60-150 cm (deep Trident) in the database. The database provides results for samples collected from 90-90 cm, 120-120 cm, and 150-150 cm, as well as samples collected from very precise depths (such as 30.48 cm and 91.44 – 152.4 cm). Thus, review the database and complete this section in the same format as Total DDx above. Since the database cannot be rectified with the data in Table D4-1, all values in the Total PAH section for shallow results should be checked and there needs to be a paragraph for the deeper data (unfiltered Geoprobe 0-90, deep Trident 60-150 filtered and unfiltered) just like the one for shallow samples below.

PAHs were detected in TZW samples offshore of all six sites. Total PAHs were identified in all of the Peeper samples, with concentrations ranging from 0.105 J ug/L at KM10A~~PR~~, offshore of Kinder Morgan, to 300 J ug/L at GS01B~~PR~~, ~~which are~~ offshore of ~~Kinder Morgan and~~ Gasco~~, respectively~~. Total PAHs were detected ~~identified~~ in all but 3 of the shallow Trident unfiltered samples with concentrations ranging from 0.0025 J ug/L at EM02A, offshore of ExxonMobil,~~TR~~ to 3,490~~1,200 J~~ ug/L at GS07B~~GS02ATR~~, ~~which are~~ offshore of ~~ARCO and~~ Gasco~~, respectively~~. Total PAHs were identified in all but two of the shallow Trident filtered samples with detected concentrations ranging from 0.0031 J ug/L at W09A~~TR~~ to 1,200 J~~3,490 NJ~~ ug/L at GS02A~~GS07BTR~~, which are offshore of Willbridge Terminal and ~~Siltronic~~Gasco, respectively.

Commented [Integral29]: Integral was able to replicate the App D4-1 table counts for both total PAHs and arsenic. To include the data used in Section 5.5 and described in 5.5.1.1. (TZW Data Set), a SCRA query should include samples from the following tasks: B01-01-52B_GW (matrix "TZW"), B01-01-49B_GW (matrix "TZW"), WLCSLH01 (matrix "TZW", and WLCGSG07 (matrix "WG"). (Note that not all samples are used – some excluded based on depth.)
In EPA's file "TZW_DB" results, it appears that the "WG" matrix was not included in their SCRA extract. This may account for the EPA comments (e.g., JMK33) indicating that counts could not be rectified with Table D4-1.

Commented [JMK30]: See comment above

Commented [Integral31]: Request that the more specific term "detected" be used throughout the text, rather than "identified".

For the deep Trident samples, total PAHs were detected in all seven unfiltered samples, with the minimum concentration of 0.61 J ug/L measured offshore of ARCO at R2AR02, and the maximum concentration of 430 ug/L measured offshore of Gasco at GS08D. Total PAHs were detected in all 4 deep Trident filtered samples, with concentrations ranging from 0.182 ug/L to 15.8 ug/L. The minimum filtered

Commented [Integral32]: EM-02-A is offshore of ExxonMobil, close to the Arco property boundary.

concentration was collocated with the minimum deep unfiltered measurement, at R2AR02. The maximum filtered deep concentration was measured at EM03A, offshore of ExxonMobil. Total PAHs were detected in all 35 Geoprobe samples collected from 0 to 90 cm bml, with a minimum concentration of 0.093 ug/L measured at GS-D3 offshore of Gasco, and a maximum concentration of 15,100 ug/L measured at GP73 offshore of the Gasco/Siltronic property boundary.

The Total PAH sample results are presented on Maps 5.5-2a–e. The map set presents filtered (top panel) and unfiltered (bottom panel) TZW results, where available, with inset histograms summarizing the distribution of samples shown on each map relative to the distribution across the TZW data set. Sample results collected between RM 6 and 7 are presented on two maps to allow for presentation of all sample concentration results in this densely sampled area (the first map shows concentration labels for LWG-collected data, and the second map shows concentration labels for non-LWG collected data). Observed PAH concentration ranges varied among the offshore study areas, with the highest total PAH concentrations consistently being observed offshore of the Gasco and Siltronic sites. The lowest range of TZW PAH concentrations was observed offshore of the Willbridge Terminal site. These relative concentration ranges are apparent on the inset histograms on Maps 5.5-2a–e.

Scatter plots of filtered and unfiltered total PAH TZW concentrations from Trident, Peeper, and Geoprobe samples are provided on Figure 5.5-1b. These figures show sample concentrations along an x-axis noting the river mile of each sample location. Color-coded symbols distinguish sample type and depth. Paired plot sets are presented for each chemical to show filtered and unfiltered results, where available.

5.5.1.7 BEHP

TZW samples collected from the offshore areas of the nine study sites were not analyzed for BEHP.

5.5.1.8 Total Chlordanes

TZW samples collected from the offshore areas of the nine study were not analyzed for chlordanes.

5.5.1.9 Aldrin

TZW samples collected from the offshore areas of the nine study sites were not analyzed for aldrin.

5.5.1.10 Dieldrin

TZW samples collected from the offshore areas of the nine study sites were not analyzed for dieldrin.

Commented [Integral33]: Per EPA comment JMK28, Integral/LWG added a paragraph describing the concentration ranges observed for the deeper data (unfiltered Geoprobe 0-90, deep Trident 90-150 filtered and unfiltered), following the format of the paragraph that EPA added above for the shallow samples.

Commented [Integral34]: For consistency with the scatter plots, this sentence and the plot should include Trident, Peeper, and Geoprobe samples.

Commented [Integral35]: A draft figure was provided to EPA on 7/18/2013.

Commented [JMK36]: Assuming that samples collected from 3551 cm to 6340 cm bml as listed as TZW in the database are really GW, then there are no TZW samples.

Commented [Integral37]: Comment JMK is correct. Geoprobe samples were collected at depths ranging from 30 to 6,300 cm bml. However, Geoprobe samples collected only in the interval of 0 to 91 cm bml are presented in this discussion of TZW.

5.5.1.11 Arsenic

TZW samples were analyzed for arsenic at all nine TZW study sites. Sampling results for arsenic are presented on scatter plots in Figure 5.5-1c. This figure shows sample concentrations along an x-axis noting the river mile of each sample location. Color-coded symbols distinguish sample type and depth. Paired plot sets are presented for each chemical to show filtered and unfiltered results, where available. Additionally, arsenic results are presented on Maps 5.5-3a–e. The map set presents filtered (top panel) and unfiltered (bottom panel) TZW results, where available, with inset histograms summarizing the distribution of samples shown on each map relative to the distribution across the TZW data set.

As shown in Table 5.5-1, arsenic data collected for TZW include results from the following samples:

- 39 Peeper samples (0 to 38 cm bml), including 10 duplicates;
- 60 shallow (0 to 30 cm bml) filtered Trident samples, including 11 duplicates;
- 64 shallow (0 to 30 cm bml) unfiltered Trident samples, including 11 duplicates;
- ~~X~~ 24 unfiltered and 12 filtered deep (~~60~~ 90 to 150 cm bml) Trident samples, including ~~6 field replicates~~5 duplicates; ~~(with collocated filtered and unfiltered samples collected at X locations); and~~
- ~~X~~ 35 unfiltered and 4 filtered samples collected with a Geoprobe from depths of 0 to 90 cm bml.

Arsenic was detected in TZW samples offshore of all nine sites. Arsenic was detected in all but two of the Peeper samples, with concentrations ranging from 0.3 J ug/L (locations ARC03B, ARC06B-1, and ARC06B-2) to 17.2 ug/L at W04C~~PR~~. The maximum detected concentration was identified offshore of the Willbridge Terminal site. Arsenic was detected in 55 of the shallow Trident filtered samples, with detected concentrations ranging from 0.55 ug/L at W09A, offshore of Willbridge Terminal,~~TR~~ to 76.8 ug/L at EM03A~~TR~~, ~~which are~~ offshore of ~~Willbridge Terminal and~~ ExxonMobil~~, respectively~~. Arsenic was detected in all but 3 of the shallow Trident unfiltered samples with concentrations ranging from 0.72 ug/L at CP08B~~TR~~ to 51.2 ug/L at W12A~~TR~~, which are offshore of Arkema and Willbridge Terminal, respectively.

For the unfiltered deep Trident samples, total arsenic was detected in all but one sample. The minimum detected concentration of 1.36 J ug/L was measured offshore of Gunderson at GN05A, and the maximum concentration of 77.1 ug/L was measured offshore of ExxonMobil at EM03A. Dissolved arsenic was detected in all 12 filtered deep Trident samples, with concentrations ranging from 0.98 ug/L to 77.3 ug/L. The minimum and maximum filtered concentrations were collocated with the minimum and maximum unfiltered concentrations, at stations GN05A and EM03A, respectively.

Commented [Integral38]: A draft figure was provided to EPA on 7/18/2013.

Commented [Integral39]: All but one deep Trident samples were collected at 90, 120, or 150 cm bml. One Trident sample was collected at 60 cm bml at location CP07B. This sample was analyzed for conventionals and metals only. This sample is included with the 90 to 150 cm bml data set for those parameters.

Commented [JMK40]: We could not confirm the number of samples collected from 0-90 cm (Geoprobe) or from 60-150 cm (deep Trident) in the database. The database provides results for samples collected from 90-90 cm, 120-120 cm, and 150-150 cm, as well as samples collected from very precise depths (such as 30.48 cm and 91.44 – 152.4 cm). Thus, review the database and complete this section in the same format as Total DDx above. Since the database cannot be rectified with the data in Table D4-1 for the deeper samples, all values in this section should be checked and there needs to be a paragraph for the deeper data (unfiltered Geoprobe 0-90, deep Trident 60-150 filtered and unfiltered) just like the one for shallow samples below.

Commented [Integral41]: Integral was able to replicate the App D4-1 table counts for both total PAHs and arsenic. To include the data used in Section 5.5 and described in 5.5.1.1. (TZW Data Set), a SCRA query should include samples from the following tasks: B01-01-52B_GW (matrix "TZW"), B01-01-49B_GW (matrix "TZW"), WLCSLH01 (matrix "TZW", and WLCGSG07 (matrix "WG"). (Note that not all samples are used – some excluded based on depth.)
In EPA's file "TZW_DB" results, it appears that the "WG" matrix was not included in their SCRA extract. This may account for the EPA comments (e.g., JMK33) indicating that counts could not be rectified with Table D4-1.

Commented [JMK42]: See comment above

Arsenic was detected in 22 of the 35 unfiltered Geoprobe samples, with the minimum detected concentration of 0.77 ug/L measured at GS-C3, and the maximum concentration of 65.4 J ug/L measured at GS-D3, both offshore of Gasco. Dissolved arsenic concentrations in the four filtered Geoprobe samples ranged from 0.94 ug/L to 5.52 ug/L, measured offshore of Gasco at stations GS-B1 and GS-B5, respectively.

Commented [Integral43]: Per EPA comment JMK40, Integral/LWG added a paragraph describing the concentration ranges observed for the deeper data (unfiltered Geoprobe 0-90, deep Trident 90-150 filtered and unfiltered), following the format of the paragraph that EPA added above for the shallow samples.

5.5.1.12 Chromium

Samples collected at all nine TZW study sites ~~and non-LWG Gasco and Siltronic field events~~ were analyzed for chromium. Analytical results for chromium are presented on scatter plots in Figure 5.5-1d. These figures show sample concentrations along an x-axis noting the river mile of each sample location. Color-coded symbols distinguish sample type and depth. Paired plot sets are presented for each chemical to show filtered and unfiltered results, where available. Additionally, chromium results are presented on Maps 5.5-4a–e. The map set presents filtered (top panel) and unfiltered (bottom panel) TZW results, where available, with inset histograms summarizing the distribution of samples shown on each map relative to the distribution across the TZW data set.

Commented [Integral44]: A draft figure was provided to EPA on 7/18/2013.

Commented [Integral45]: A draft figure was provided to EPA on 7/18/2013.

As shown in Table 5.5-1, chromium data collected within the Study Area offshore of the nine sites referenced above include results from the following samples:

- 39 Peeper samples (0 to 38 cm bml), including 10 duplicates;
- 62 shallow (0 to 30 cm bml) filtered Trident samples, including 11 duplicates;
- 65 shallow (0 to 30 cm bml) unfiltered Trident samples, including 11 duplicates;
- 25 unfiltered and 13 filtered deep (60 to 150 cm bml) Trident samples ~~in this data set (with collocated filtered and unfiltered samples collected at X locations);~~ including 3 unfiltered and 2 filtered duplicates; and
- ~~filtered samples collected with a Geoprobe from depths of 0 to 90 cm bml; and~~
- ~~X~~ 35 unfiltered and 4 filtered samples collected with a Geoprobe from depths of 0 to 90 cm bml.

Commented [Integral46]: All but one deep Trident samples were collected at 90, 120, or 150 cm bml. One Trident sample was collected at 60 cm bml at location CP07B. This sample was analyzed for conventionals and metals only. This sample is included with the 90 to 150 cm bml data set for those parameters.

Commented [JMK47]: We could not confirm the number of samples collected from 0-90 cm (Geoprobe) or from 60-150 cm (deep Trident) in the database. The database provides results for samples collected from 90-90 cm, 120-120 cm, and 150-150 cm for example. Thus, review the database and complete this section in the same format as Total DDx above. Since the database cannot be rectified with the data in Table D4-1 for the deeper samples, all values in this section should be checked. There needs to be a paragraph for the deeper data (unfiltered and filtered Geoprobe 0-90, deep Trident 60-150 filtered and unfiltered) just like the one for shallow samples below once database is reviewed..

Commented [JMK48]: See comment above

Commented [JMK49]: See comment above

Chromium was detected in TZW samples collected from locations offshore of all nine sites. Chromium was detected in 17 of the Peeper samples, with concentrations ranging from 0.92 ug/L at location CP09D~~PR~~ to 31.6 ug/L at CP07B, both of which were identified offshore of the Arkema site. Chromium was detected in 34 of the shallow Trident filtered samples, with detected concentrations ranging from 0.2 J ug/L at W09A, offshore of Willbridge Terminal,~~TR~~ to 98.3 ug/L at CP07B, ~~which are~~ offshore of ~~Willbridge Terminal and~~ Arkema~~, respectively~~. Chromium was detected in 45 of the shallow Trident unfiltered samples with concentrations ranging from 0.79 ug/L at

SL03A~~TR~~ to 122 ug/L at CP07B, which are offshore of ~~Gasco~~ Siltronic and Arkema, respectively.

For the unfiltered deep Trident samples, total chromium was detected 20 samples. The minimum detected concentration of 0.8 ug/L was measured adjacent to Rhone Poulenc at RP02E, and the maximum concentration of 102 ug/L was measured offshore of the Arkema site at CP07B. Dissolved chromium was detected in 7 filtered deep Trident samples, with concentrations ranging from 0.36 ug/L at EM01A, offshore of ExxonMobil, to 49.6 ug/L at CP07B. Chromium was detected in all of the 35 unfiltered Geoprobe samples, with the minimum detected concentration of 2.07 ug/L measured at GS-D2 offshore of Gasco, and the maximum concentration of 537 ug/L measured at GS-B9 offshore of Siltronic. Dissolved chromium concentrations in the three detected filtered Geoprobe samples ranged from 0.45 ug/L to 0.69 ug/L, measured offshore of Gasco at stations GS-B4 and GS-B5, respectively.

Commented [Integral50]: Per EPA comment JMK47, Integral/LWG added a paragraph describing the concentration ranges observed for the deeper data (unfiltered Geoprobe 0-90, deep Trident 90-150 filtered and unfiltered), following the format of the paragraph that EPA added above for the shallow samples.

5.5.1.12 Copper

Samples collected at all nine TZW study sites and non-LWG Gasco and Siltronic field events were analyzed for copper. Analytical results for copper are presented on scatter plots in Figures 5.5-1e. These figures show sample concentrations along an x-axis noting the river mile of each sample location. Color-coded symbols distinguish sample type and depth. Paired plot sets are presented for each chemical to show filtered and unfiltered results, where available. Additionally, copper results are presented on Maps 5.5-5a–e. The map set presents filtered (top panel) and unfiltered (bottom panel) TZW results, where available, with inset histograms summarizing the distribution of samples shown on each map relative to the distribution across the TZW data set.

Commented [Integral51]: A draft figure was provided to EPA on 7/18/2013.

As shown in Table 5.5-1, copper data collected within the Study Area offshore of the nine sites referenced above include results from the following samples:

- 39 Peeper samples (0 to 38 cm bml), including 10 duplicates;
- 50 shallow (0 to 30 cm bml) filtered Trident samples, including 9 duplicates;
- 53 shallow (0 to 30 cm bml) unfiltered Trident samples, including 9 duplicates;
- ~~X~~18 unfiltered and 12 filtered deep (~~60~~ 90 to 150 cm bml) Trident samples including 3 unfiltered and 2 filtered duplicates; and ~~in this data set (with collocated filtered and unfiltered samples collected at X locations);~~
- ~~X filtered samples collected with a Geoprobe from depths of 0 to 90 cm bml; and~~
- ~~X~~35 unfiltered and 4 filtered samples collected with a Geoprobe from depths of 0 to 90 cm bml.

Commented [JMK52]: We could not confirm the number of samples collected from 0-90 cm (Geoprobe) or from 60-150 cm (deep Trident) in the database. The database provides results for samples collected from 90-90 cm, 120-120 cm, and 150-150 cm, as well as very precise depth intervals like 91.44 to 152.4 for example. Thus, review the database and complete this section in the same format as Total DDx above. Since the database cannot be rectified with the data in Table D4-1 for the deeper samples, all values in this section should be checked. There needs to be a paragraph for the deeper data (unfiltered and filtered Geoprobe 0-90, deep Trident 60-150 filtered and unfiltered) just like the one for shallow samples below once database is reviewed..

Commented [JMK53]: See comment above

Commented [JMK54]: See comment above

Copper was detected in TZW samples collected from locations offshore of all nine sites. Copper was detected in 5 Peeper samples, with concentrations ranging from 1.63 ug/L at location ARC02B to 22.1 ug/L at CP07D~~PR~~. The maximum detected concentration was identified offshore of the Arkema site. The remaining four detected copper concentrations were identified in samples collected from locations offshore of ARCO.

Copper was detected in 10 of the shallow Trident filtered samples, with detected concentrations ranging from 0.36 ug/L at R2KM01~~TR~~ to 3.63 ug/L at R2RP03~~TR~~, which are offshore of Kinder Morgan and Rhone Poulenc, respectively. ~~Of the remaining 8 samples in which copper was detected, 3 were collected offshore of ExxonMobil, 2 were collected from locations offshore of Rhone Poulenc, 2 were collected from locations offshore of Willbridge Terminal, and 1 was offshore of ARCO.~~ Copper was detected in 35 of the shallow Trident unfiltered samples with concentrations ranging from 1.54 ug/L at ARC02B to 63.1 ug/L at EM02C~~TR~~, which are offshore of ARCO and ExxonMobil, respectively.

For the unfiltered deep Trident samples, total copper was detected 13 samples. The minimum detected concentration of 1.79 ug/L was measured adjacent to Rhone Poulenc at RP02E, and the maximum concentration of 43.7 ug/L was measured offshore of the Siltronic site at SL03F. Dissolved copper was detected in 7 filtered deep Trident samples, with concentrations ranging from 0.24 ug/L at GN05A, offshore of Gunderson, to 1.89 J ug/L at R2AR02, offshore of ARCO. Copper was detected in 29 of the unfiltered Geoprobe samples, with the minimum detected concentration of 1.01 J ug/L measured at GS-C6, offshore of Gasco, and the maximum concentration of 555 ug/L measured at GS-B9, offshore of Siltronic. Dissolved copper concentrations were detected in all four filtered Geoprobe samples; concentrations ranged from 0.28 ug/L at locations GS-B4 and GS-B5 to 0.79 ug/L at GS-B2, all measured offshore of Gasco.

5.5.1.12 Zinc

Samples collected from all nine TZW study sites and non-LWG Gasco and Siltronic field events were analyzed for zinc. Analytical results for zinc are presented on scatter plots in Figures 5.5-1f. These figures show sample concentrations along an x-axis noting the river mile of each sample location. Color-coded symbols distinguish sample type and depth. Paired plot sets are presented for each chemical to show filtered and unfiltered results, where available. Additionally, zinc results are presented on Maps 5.5-6a–e. The map set presents filtered (top panel) and unfiltered (bottom panel) TZW results, where available, with inset histograms summarizing the distribution of samples shown on each map relative to the distribution across the TZW data set.

As shown in Table 5.5-1, zinc data collected within the Study Area offshore of the nine sites referenced above include results from the following samples:

- 39 Peeper samples (0 to 38 cm bml), including 10 duplicates;
- 60 shallow (0 to 30 cm bml) filtered Trident samples, including 11 duplicates;

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Commented [Integral55]: This sentence and the level of detail provided are inconsistent with the narratives for other contaminants. Request deletion.

Commented [Integral56]: Per EPA comment JMK52, Integral/LWG added a paragraph describing the concentration ranges observed for the deeper data (unfiltered Geoprobe 0-90, deep Trident 90-150 filtered and unfiltered), following the format of the paragraph that EPA added above for the shallow samples.

Commented [Integral57]: A draft figure was provided to EPA on 7/18/2013.

- 64 shallow (0 to 30 cm bml) unfiltered Trident samples, including 11 duplicates;
- ~~X~~ 24 unfiltered and 12 filtered deep (60 to 150 cm bml) Trident samples ~~in this data set (with collocated filtered and unfiltered samples collected at X locations);~~including 3 unfiltered and 2 filtered ~~field replicates~~duplicate samples; and~~.~~

~~X filtered samples collected with a Geoprobe from depths of 0 to 90 cm bml; and~~

- ~~X~~35 unfiltered and 4 filtered samples collected with a Geoprobe from depths of 0 to 90 cm bml.

Zinc was detected in TZW samples collected from locations offshore of all nine sites. Zinc was detected in 18 Peeper samples, with concentrations ranging from 7.11 J ug/L at location R2KM02~~PR~~, which is offshore of Kinder Morgan, to 418 ug/L at R2CP01~~PR~~. The maximum detected concentration was identified offshore of the Arkema site.

Zinc was detected in 32 of the shallow Trident filtered samples, with detected concentrations ranging from 0.95 ug/L at R2KM01~~TR~~ to 526 ug/L at R2AR01~~TR~~, which are offshore of Kinder Morgan and ARCO, respectively. Zinc was detected in 39 of the shallow Trident unfiltered samples with concentrations ranging from 7.81 J ug/L at W09A~~TR~~ to 556 ug/L at R2AR01~~TR~~, which are offshore of Willbridge Terminal and ARCO, respectively.

For the unfiltered deep Trident samples, total zinc was detected 17 samples. The minimum detected concentration of 18.6 J ug/L was measured at AP03D offshore of Arkema Acid Plant area, and the maximum concentration of 161 ug/L was measured at CP07B offshore of the Arkema Chlorate Plant area. Dissolved zinc was detected in 7 filtered deep Trident samples, with concentrations ranging from 1.87 J ug/L at AR01A to 9.78 ug/L at R2AR02, both offshore of ARCO. Zinc was detected in all but one of the 35 unfiltered Geoprobe samples, with the minimum detected concentration of 8.3 ug/L measured at GS-C6 and the maximum concentration of 3,590 ug/L measured at GS-B4, both offshore of Gasco. Dissolved zinc concentrations in the filtered Geoprobe samples ranged from 2.93 ug/L to 22.5 ug/L, measured offshore of Gasco at stations GS-B2 and GS-B5, respectively.

Commented [JMK58]: We could not confirm the number of samples collected from 0-90 cm (Geoprobe) or from 60-150 cm (deep Trident) in the database. The database provides results for samples collected from 90-90 cm, 120-120 cm, and 150-150 cm, as well as very precise depth intervals like 91.44 to 152.4 for example. Thus, review the database and complete this section in the same format as Total DDx above. Since the database cannot be rectified with the data in Table D4-1 for the deeper samples, all values in this section should be checked. There needs to be a paragraph for the deeper data (unfiltered and filtered Geoprobe 0-90, deep Trident 60-150 filtered and unfiltered) just like the one for shallow samples below once database is reviewed..

Commented [JMK59]: See comment above

Commented [JMK60]: See comment above

Commented [Integral61]: Per EPA comment JMK58, Integral/LWG added a paragraph describing the concentration ranges observed for the deeper data (unfiltered Geoprobe 0-90, deep Trident 90-150 filtered and unfiltered), following the format of the paragraph that EPA added above for the shallow samples.

5.5.1.12 TBT

TZW samples collected from the offshore areas of the nine study sites were not analyzed for TBT.

~~5.5.3~~5.5.2 Groundwater Seeps

This section summarizes the location, available chemical data, and data quality assessment for upland groundwater seeps. The groundwater seep data set is limited because a comprehensive seep characterization survey was not part of the Portland Harbor RI program. Consequently, the data set does not lend itself to the same contaminant distribution discussions applied to TZW and other media in this report (specifically, discussion of select analytes).

Commented [Integral62]: Per meeting with EPA on 7/8/14, retained this language to describe the seeps data limitations.

~~5.5.3.1~~5.5.2.1 Groundwater Seep Locations

A seep reconnaissance survey was conducted during Round 1 of the Portland Harbor RI/FS (GSI 2003b) to support the BHHRA and development of the CSM. This survey documented readily identifiable groundwater seeps based on visual observations along approximately 17 miles of riverbank from RM 2 to 10.5. For the purposes of this survey, a seep was defined as groundwater discharge above the Willamette River water line as observed during the seep reconnaissance survey. This groundwater may be discharged from local shallow groundwater systems, perched groundwater, water seeping through utility backfill, or return flow from tidally influenced bank storage. Observed seeps were classified into one or more of five types:

- Seepage line at the base of embankments (nine seeps)
- Linear and point seeps at the foot of beaches (six seeps)
- Seepage through backfill surrounding outfalls (four seeps)
- Seepage of NAPL (two seeps)
- Potential seep locations identified by observation of extensive ferric hydroxide staining of bank materials (eight potential seeps).

Additionally, eight seeps were categorized as combinations of the above seep types.

5.5.2.2 Groundwater Seep Water Quality Data

Seep water quality samples have been collected at six seeps in four general areas (Map 5.4-7). The water quality sampling efforts conducted for upland groundwater seeps include:

Commented [Integral63]: Presented as a figure in Draft Final RI; per EPA edits, need to revised figure and present in map format. Include all seep locations presented in this section on the figure

- City of Portland stormwater Outfalls 22B and 22C, located directly north and south of the Railroad Bridge at RM 6.89 and 6.82, respectively, are type 3 (backfill surrounding outfalls) seeps. Both Rhone Poulenc and NW Natural have collected water quality samples in Outfalls 22B and 22C to evaluate potential groundwater infiltration to the conveyance systems. These results are described in the next two bullets in this list. ~~The samples were analyzed for~~

~~conventional parameters, metals, PCB Aroclors, PCDD/Fs, pesticides, PAHs, phthalates, SVOCs, phenols, petroleum hydrocarbons, and VOCs.~~

- Rhone Poulenc sampled Outfall 22B on five occasions between October 1, 1993 and September 23, 2004 and Outfall 22C four times between August 13, 2002 and September 23, 2004. Samples were collected at the end of the pipe and were analyzed for 231 individual parameters, including conventionals, PCDD/Fs, herbicides, metals, PAHs, PCB Aroclors, pesticides, petroleum hydrocarbons, phenols, phthalates, SVOCs, and VOCs. The results are Category 1 data validated to the QA2 level, with the exception of petroleum hydrocarbon results measured on September 23, 2004, which are Category 2 data and will be excluded from this discussion.
- NW Natural sampled Outfall 22C on February 24, 2005 for 89 individual parameters, including conventionals, metals, PAHs, phenols, phthalates, SVOCs, and VOCs. Data were validated to Category 2, QA1 level.
- Seeps-01, -02, and -03 are located at the Gunderson site near RM 8.5. These type 3 seeps are associated with cracked stormwater drain pipes. Each seep was sampled once in November 2004 and again in April 2005, with samples analyzed for 31 individual parameters, including conventionals, metals, PCB Aroclors, PAHs, petroleum hydrocarbons, SVOCs, VOCs, and phthalates. Data were validated to Category 1, QA1.
- ExxonMobil sampled areas with visible sheen on sand and in pooled water along the riverbank at the ExxonMobil site under the direction of DEQ on August 13, 2004 (Kleinfelder 2004) and October 6, 2003. Two composite samples were analyzed as soils for DRH, GRH, and RRH. Data were validated to the QA1 level. All results were below instrument detection limits.

A summary of the indicator contaminant~~IC~~ data collected at each of the above mentioned locations is provided in Table 5.5-2. All of the seep data collected from these locations is presented in Appendix D4 (Table D4-2)

~~5.5.2.2.1 Outfalls 22B and 22C~~

~~As indicated above, the City of Portland and Rhone Poulenc collected samples from Outfall 22B and Outfall 22C. In addition, NW Natural collected samples from Outfall 22 C. The analytical results for the ICs detected in these samples are summarized below.~~

~~5.5.2.2.2 Seep-01 through Seep-03~~

~~Of the ICs, PAHs, BEHP, and four metals (arsenic, chromium, copper and zinc) were detected above laboratory reporting limits in one or more samples collected from these three seeps. The remaining ICs for which analysis was conducted were not detected.~~

Commented [Integral64]: This bullet is somewhat confusing as it is redundant with the next two bullets. Proposed text revisions for clarity.

Commented [Integral65]: Per EPA edit, need to develop table of indicator contaminant data collected at all seep locations. Table will be drafted.

Commented [JMK66]: This appendix table needs to provide all of the seep data, not just the data associated with locations evaluated in the HHRA.

Commented [Integral67]: Per EPA edit, appendix table will be updated to include all seep data.

Commented [JMK68]: These data could not be identified in the database, so if these data were excluded from the database, they should be added. Additionally, a summary should be provided in this section for each of the indicator contaminants. Note if each was detected or not and if detected, what the concentration ranges were. Follow example provided below for Seep-01 through Seep-03 data

Commented [Integral69]: Integral/LWG: To include all seeps data used in this section, the SCRA can be queried for the following:
Seeps-01, -02, -03, Task WLCGND05, matrix "WP";
ExxonMobil Beach Sediment Sheen Samples, Task WLCEMH04, matrix of "SE";
COP Outfalls 22B and 22C, Tasks WLCRPI04 and WLCGSB05, matrix of "WO".
EPA's file "seep_DB_results" appears to include only Task WLCGND05, matrix "WP".

Per RI Section 2: Both Category 1 QA1 and Category 1 QA2 data are used to describe the nature and extent of contamination (Section 5).

Commented [Integral70]: Per meeting with EPA on 7/8/14, data for all seeps will be presented in the main text summary table 5.5-2 and the Appendix D4 summary stats tables. Text discussions of seeps results were removed. Seeps data are extremely limited and seeps were never sampled comprehensively/systematically across the Study Area. The seeps data has been used in determination of potential complete groundwater pathways from upland to the river, as well as in the human health risk assessment. The data are not adequate to support a chemical distribution discussion such as presented in Section 5 for other mediadoes not lend itself to the general organization of the contaminant distribution discussions applied.

~~Total PAHs~~

~~PAH analysis was conducted for the sample collected from Seep-01 in April 2005; however, PAHs were not detected. PAHs were detected in both samples collected from Seep-02, with total PAH concentrations of 3.19 J ug/L (November 2004) and 4.53 J ug/L (April 2005). PAH analysis was not conducted for samples collected from Seep-03.~~

~~BEHP~~

~~The samples collected from Seep-01, Seep-02, and Seep-03 during both sampling events were analyzed for BEHP. BEHP was not detected in either sample collected from Seep-01. BEHP was detected at concentrations of 0.527 ug/L (November 2004) and 1.65 ug/L (April 2005) in the samples collected from Seep-02. BEHP was detected in the sample collected from Seep-03 in November 2004 at a concentration of 2.74 ug/L, but was not detected in the sample collected from Seep-03 in April 2005.~~

~~Arsenic~~

~~The samples collected from Seep-01, Seep-02, and Seep-03 during both sampling events were analyzed for arsenic. Arsenic was detected in the sample collected from Seep-01 in November 2004 at a concentration of 1.15 ug/L, but was not detected in the sample collected in April 2005. Arsenic was detected at concentrations of 6.03 ug/L (November 2004) and 4.79 ug/L (April 2005) in the samples collected from Seep-02. Arsenic also was detected in the samples collected from Seep-03 at concentrations of 46.6 ug/L (November 2004) and 1.92 ug/L (April 2005).~~

~~Chromium~~

~~The samples collected from Seep-01, Seep-02, and Seep-03 during both sampling events were analyzed for chromium. Chromium was detected in both samples collected from Seep-01 at concentrations of 2.32 ug/L (November 2004) and 2.44 ug/L (April 2005). Chromium also was detected at concentrations of 41.4 ug/L (November 2004) and 25.2 ug/L (April 2005) in the samples collected from Seep-02. Chromium was detected in the samples collected from Seep-03 at concentrations of 46.5 ug/L (November 2004) and 1.94 ug/L (April 2005).~~

~~Copper~~

~~The samples collected from Seep-01, Seep-02, and Seep-03 during both sampling events were analyzed for copper. Copper was detected in both samples collected from Seep-01 at concentrations of 140 ug/L (November 2004) and 32.5 ug/L (April 2005). Copper also was detected at concentrations of 373 ug/L (November 2004) and 241 ug/L (April 2005) in the samples collected from Seep-02. Copper was detected in the samples collected from Seep-03 at concentrations of 1,500 ug/L (November 2004) and 5.44 ug/L (April 2005).~~

~~**Zinc**~~

~~The samples collected from Seep-01, Seep-02, and Seep-03 during both sampling events were analyzed for zinc. Zinc was detected in both samples collected from Seep-01 at concentrations of 573 ug/L (November 2004) and 215 ug/L (April 2005). Zinc also was detected at concentrations of 1,450 ug/L (November 2004) and 1,170 ug/L (April 2005) in the samples collected from Seep-02. Zinc was detected in the samples collected from Seep-03 at concentrations of 2,060 ug/L (November 2004) and 787 ug/L (April 2005).~~

~~**5.5.2.2.3 Exxon Mobil**~~

Commented [JMK71]: With data not identified in the database for ExxonMobil, please see comments above and follow discussion format provided for Seeps-01 through -03 in completing this discussion.